



# PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION

### Improvements in and relating to the Treatment of Leguminous Protein Materials

We, **BRITISH SOYA PRODUCTS LIMITED**, a Company registered under the laws of Great Britain, of Chantrey Villa, Chantrey Road, Bishops Stortford, in the County of Hertford, and **CLIFFORD FINCHER CLAY**, a citizen of the United States of America, of the Company's address, do hereby declare the nature of this invention to be as follows:—

10 This invention relates to the treatment of vegetable protein materials derived from soya bean and other seeds.

The proteins present in soya beans and other seeds and vegetable materials 15 generally are of several types some of which are soluble in distilled water, another or others in water containing salts in certain concentrations, others in water which has an alkaline reaction, 20 and others which are soluble in alcohol. When several types are dissolved in solvents and mixed together precipitation of certain types of protein takes place.

25 In order that the protein content of soya beans and other seeds or vegetable material may be employed for nutritional and other purposes to the best advantage, it 30 is desirable that the various types of protein should be treated in order that they or their degradation products such as amino acids, may be readily assimilated.

According to the invention the soya 35 beans or seeds or other vegetable material, preferably in the form of meal or flour in admixture with water, is subjected to the action of proteolytic enzymes at a temperature suitable to 40 promote the proteolytic action of such enzymes.

Generally, the employment of two types of proteolytic enzymes or ferments is desirable, that is to say, ferments or 45 enzymes of the type of pepsin and ferments or enzymes of the type of trypsin.

While the employment simultaneously of the two types of enzymes is not excluded from the invention generally it 50 will be found desirable to employ the succession. In the latter case, after the

two types of ferments or enzymes in treatment with one type of ferment or enzyme the solution or dispersion may be treated to effect separation of any pre- 55 cipitated or insoluble material and thereafter treated with a ferment or enzyme of the other type, and the precipitated or insoluble residue may be treated in the presence of water with the ferment 60 of the other type.

Thus, for example, soya bean or other seed or protein-containing vegetable material of other character in the form of meal or flour in admixture with water 65 may be subjected to the action of a ferment of the pepsin type which may be a gastric extract or papain or pawpaw juice, or a synthetic pepsin.

The treatment with this ferment may 70 be effected at a temperature of 58° C. and the fermented product may be filtered or otherwise treated to remove the insoluble material which, in association with water and in a slightly alkaline 75 condition, may be subjected to the action of a ferment of the trypsin type, such treatment may advantageously be carried out at a temperature of 40—43° C.

At this point it may be mentioned that 80 the treatments for the ferments may be carried out at any temperatures which do not have a substantial prejudicial effect upon their action.

In the treatment with a ferment of the 85 trypsin type pancreatic juice or extract may be employed instead of relatively pure trypsin.

While above it has been indicated that the treatment with a ferment or enzyme 90 of the pepsin type precedes the treatment with a ferment of the trypsin type, the order of treatment with ferment of the two types may be reversed.

Where necessary or desirable for 95 dietetic or other reasons, the soluble salts and soluble carbohydrates may be eliminated as, for instance, by the treatment of an aqueous suspension of the soya bean meal or the like or the digested products either individually or collectively 100 by dialysis.

The digested products, that is to say the products which are obtained by the treatment with ferments or enzymes, may individually or collectively, after separation if desired from any insoluble residue, be concentrated under vacuum or atmospheric pressure by processes which may be carried out at temperatures having no substantially adverse effect

on the conditions or properties of the digested material. Thus the liquid products may be subjected to spray drying or roller drying in order to obtain an end product in the form of powder.

Dated this 21st day of September, 1945.

MARKS & CLERK.

## COMPLETE SPECIFICATION

### Improvements in and relating to the Treatment of Leguminous Protein Materials

15 We, BRITISH SOYA PRODUCTS LIMITED, a Company registered under the laws of Great Britain, of Chantrey Villa, Chantrey Road, Bishops Stortford, in the County of Hertford, and CLIFFORD  
20 FINCHER CLAY, a citizen of the United States of America, of the Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and  
25 by the following statement:—

This invention relates to the treatment of soya beans, arachis and other leguminous seeds having a high protein  
30 content.

In order that the protein content of soya beans and other seeds may be employed for nutritional and other purposes to the best advantage, it is known that it is desirable that the various types  
35 of protein may be treated, preferably in the form of meal or flour in admixture with water, with enzymes or ferments of the type of pepsin and ferments or  
40 enzymes of the type of trypsin in order that they or their degradation products such as amino acids may be readily assimilated.

According to the invention the treatments with the two types of ferments or  
45 enzymes are effected in succession.

Preferably the seed meal or flour treated is such as has had its fat content substantially completely or at least  
50 mainly extracted as generally the presence with the protein material of fat or the products thereof formed by lipolytic action would be undesirable.

After the treatment with one type of  
55 ferment or enzyme the solution or dispersion of protein may be treated to effect separation of any precipitated or insoluble material and thereafter treated with a ferment or enzyme of the other  
60 type, and the precipitated or insoluble residue may be treated in the presence of

water with the ferment of the other type.

Thus, for example, soya bean or other seed or other vegetable material of high  
65 protein content in the form of meal or flour in admixture with water may be subjected to the action of a ferment of the pepsin type which may be a gastric extract or papain or pawpaw juice.

The treatment with this ferment may be effected at a temperature of 58° C. and the fermented product may be  
70 filtered or otherwise treated to remove the insoluble material which, in association with water and in a neutral or slightly alkaline condition, may be subjected to the action of a ferment of the trypsin type, such treatment may advantageously be carried out at a temperature  
80 of 40—43°.

At this point it may be mentioned that the treatments with the ferments may be carried out at any temperatures which do not have a substantial prejudicial effect  
85 upon their action.

In the treatment with a ferment of the trypsin type, pancreatic juice or extract may be employed instead of relatively  
90 pure trypsin.

While above it has been indicated that the treatment with a ferment or enzyme of the pepsin type precedes the treatment with a ferment of the trypsin type, the order of treatment with ferment of the  
95 two types may be reversed.

Where necessary or desirable for dietetic or other reasons, the soluble salts and soluble carbohydrates may be eliminated prior to the proteolytic treatment  
100 as, for instance, by the dialysis of an aqueous suspension of the soya bean meal or the like. The digested products either individually or collectively may also be treated by dialysis, in which case  
105 the truly soluble materials formed by proteolytic action will be separated from the non-soluble or colloidal residue.

The digested products, that is to say the products which are obtained by the treatment with the ferments or enzymes, may individually or collectively, after separation if desired from any insoluble residue, be concentrated under vacuum or atmospheric pressure by processes which may be carried out at temperatures having no substantially adverse effect on the conditions or properties of the digested material. Thus the liquid products may be subjected to spray drying or roller drying in order to obtain an end product in the form of powder.

The following particulars are given by way of example to illustrate a suitable manner of carrying the invention into effect:—

30 lbs. of soya bean meal are mixed with 250 lbs. water and raised to a temperature of 58° C. To this mixture are added 1 oz. hydrochloric acid and 2 oz. parts by weight of scale pepsin B.P. standard. The mixture is maintained at the temperature stated for a period of two hours, the pH of the mixture being adjusted to 5.3. The product is filtered and the pH filtrate adjusted to 7 and its temperature to 39° C. 3 in 200 parts of trypsin are then added and the action of this ferment or enzyme is allowed to continue for a period of three hours.

Having now particularly described and ascertained the nature of our said inven-

tion and in what manner the same is to be performed, we declare that what we claim is:—

1. The process of treating soya beans, arachis and other leguminous seeds of high protein content by subjecting such seed material, preferably in the form of meal or flour in admixture with water, to the action of proteolytic enzymes of the type of pepsin and also to the action of enzymes of the type of trypsin, characterised in this that the treatments with the two types of ferments or enzymes are effected in succession.

2. A process as claimed in Claim 1, in which the leguminous material of high protein content treated is such as has had its fat content substantially completely or at least mainly extracted.

3. A process as claimed in Claim 1, in which after the treatment with one type of ferment or enzyme the solution or dispersion of protein is treated to effect separation of any precipitated or insoluble material and thereafter treated with a ferment or enzyme of the other type.

4. Products when obtained by treating leguminous seed material by the processes claimed in any of the preceding claims.

Dated this 8th day of October, 1946.

MARKS & CLERK.